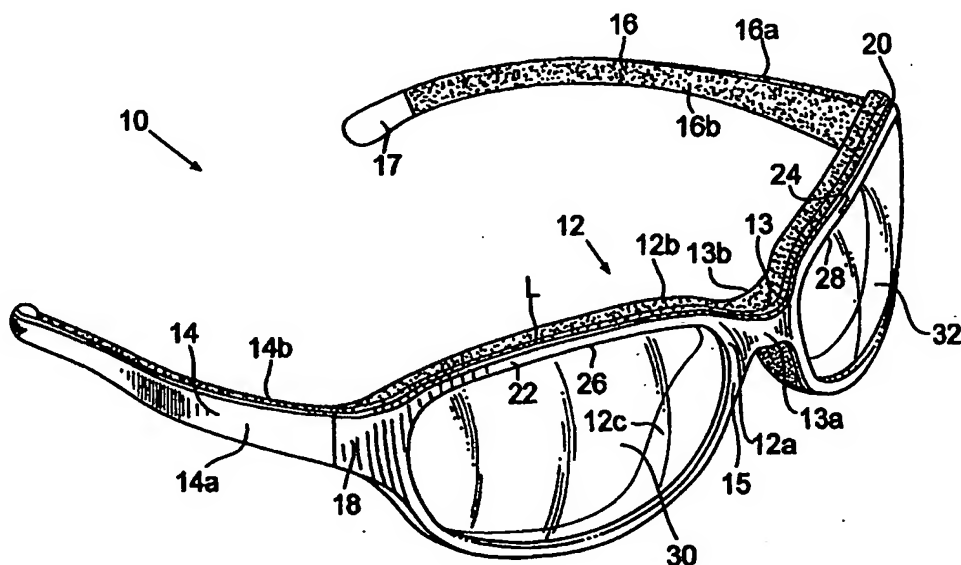




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁶ : B29D 12/02, G02C 5/00, B29C 45/16</p>	<p>A1</p>	<p>(11) International Publication Number: WO 99/56942 (43) International Publication Date: 11 November 1999 (11.11.99)</p>
<p>(21) International Application Number: PCT/US99/10090 (22) International Filing Date: 6 May 1999 (06.05.99) (30) Priority Data: 09/074,083 7 May 1998 (07.05.98) US (71) Applicant: BAUSCH & LOMB INCORPORATED [US/US]; One Bausch & Lomb Place, Rochester, NY 14604 (US). (72) Inventor: CONWAY, Simon, M.; 1840 Genesee Street, Lima, NY 14485 (US). (74) Agents: McGUIRE, Katherine et al.; Bausch & Lomb Incorporated, One Bausch & Lomb Place, Rochester, NY 14604 (US).</p>		<p>(81) Designated States: AL, AU, BA, BB, BG, BR, CA, CN, CU, CZ, EE, GD, GE, HR, HU, ID, IL, IS, JP, KP, KR, LC, LK, LR, LT, LV, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, SL, TR, TT, UA, UZ, VN, YU, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report.</p>

(54) Title: EYEWEAR FRAME CONSTRUCTION



(57) Abstract

An injection molded eyewear frame formed of molecularly bonded, first and second mold materials having differing hardness values. In the preferred embodiment, a unitary eyewear front frame having inside and outside surfaces is molded with the outside surface thereof being formed of a first mold material which is more rigid than a second mold material used to form the inside surfaces of the front frame. The invention may be used to form the temples of an eyewear also.

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Application of: Simon M. Conway
Title of Invention: Eyewear Frame Construction

Background of the Invention

The present invention relates to eyewear frames, and more particularly relates to a plastic eyewear frame construction.

Plastic eyewear frames have been in existence of many years and are a particularly popular material of choice in making sunglass frames. The present-day, primary manufacturing methods employed in making plastic eyewear frames are injection molding and cutting and forming. The present invention concerns the injection molding method of plastic eyewear frames.

A typical eyewear injection mold is comprised of two halves which are brought together to define an internal mold cavity having the shape of the desired front frame. The finished front frame may be of the unitary type, including right and left eye rims with an integrally formed bridge extending therebetween. Alternately, the right and left eye rims may be formed as separate components which are subsequently mechanically joined by a separate bridge component, itself being made of either plastic or metal. Certain post-molding operations may also be performed on the molded frame, such as cutting of grooves to accept the lenses in each eye rim, although the lens grooves are typically incorporated into the mold itself. Other post-molding operations may include the forming of hinge openings at the lateral sides of the front frame for accepting a mating hinge component of the pair of temples.

Yet a further post-molding operation of plastic eyewear frames is surface finishing for aesthetic effect (e.g., application of pigments to create color variations and patterns), as well as to remove any sharp or uneven areas which would prove uncomfortable to the wearer of the sunglass. Regarding comfort, plastic eyewear frames must maintain a certain rigidity to remain in proper positioning on the face, and as such are typically made quite hard and unyielding. This is particularly true of eyewear front frames having plastic eye rims (unitary or singly formed), which are generally regarded as unacceptable for use in sports due to their lack of any cushioning or protection from front impacts to the face. Attempts to create cushioning for a plastic frame have involved a post-molding

application of a cushioning material (e.g., foam) to the rearward-facing surface of the front frame. Examples of this cushioning technique may be seen in the following patents:

Patent No. 5,495,303 issued 2/27/96 to Kolentsi

Patent No. 5,416,536 issued 5/16/95 to Tee, Jr.

As seen in these patents, the upper brow is a typical location to apply cushioning to the frame. The cushioning material is usually fixed to the frame with an adhesive, mechanical fasteners or grooves formed in the frame and into which the cushioning material is inserted and held. In use, the cushioning material is prone to tearing and/or separating from the plastic frame. Also, it is desirable to keep post-molding operations to a bare minimum due to the added manufacturing costs they incur. Thus, while cushioning of hard plastic frames is desirable from a safety and comfort standpoint, the techniques described above are undesirable due to the fragility of the cushioning material and added expense to the manufacturing process.

Summary of the Invention

The present invention successfully addresses the above-described deficiencies in the prior art by providing an eyewear frame which is formed of a rigid plastic across substantially the entire front-facing surface thereof, and of a soft plastic across substantially the entire rearward-facing surface thereof, wherein the rigid (front surface) plastic and soft (rear surface) plastic are sequentially shot in first and second mold cavities. As such, the rigid plastic and soft plastic which comprise the front frame are bonded at the molecular level to provide ultimate assurance against separation of the two materials during use.

The type and hardness of the two materials are carefully selected to achieve optimum performance of the frame. The rigidity of the forward surface is selected so as to maintain the frame in the proper position on the wearer's face, while the hardness of the rear surface is selected and controlled so as to provide a soft, comfortable fit while also providing a cushioning component between the face and the harder, forward surface

of the frame. Preferred durometer values and material types of the frame are provided and discussed in the Detailed Description below.

An eyewear frame made in accordance with the present invention may be formed as either a unitary front frame (including an integrally formed bridge extending between the pair of eye rims) or as separate eye rims which are subsequently interconnected by a separate bridge component which itself may or may not be formed in accordance with the present invention, as desired. Also, nose pads may be incorporated into the mold cavity geometry of the invention or attached separately, as desired. In the preferred embodiment, each of the pair of temple members are also formed in accordance with the present invention.

Brief Description of the Drawings

Figure 1 is a front, perspective view of an eyewear made in accordance with the present invention;

Figure 2 is a front, elevational view thereof;

Figure 3 is a side, elevational view thereof;

Figure 4 is a top, plan view of the base frame component of the present invention;

Figure 5 is a front, elevational view thereof;

Figure 6 is a side, elevational view thereof;

Figure 7 is a front, elevational view of the front frame;

Figure 8 is a cross-sectional view thereof taken generally along the line 8-8 in Fig. 7; and

Figure 9 is a fragmented, longitudinal cross-sectional view of the temple tip of the eyewear.

Detailed Description

Referring to the drawing, there is seen in Figure 1 an eyewear designated generally at 10 having a front frame 12 and right and left temples 14, 16 which are pivotally connected to front frame 12 at the opposite lateral side portions 18, 20 thereof via integral hinge components 18', 20' (Fig. 4). The front frame 12 is of a unitary construction having right and left eye rims 22, 24 defining right and left eye openings 26, 28 wherein right and

left lenses 30,32 are secured, respectively. A bridge portion 13 extends between and is integrally formed with eye rims 22,24. Although the invention is described and shown herein with reference to a front frame 12 of unitary construction, the invention may be used for other types of front frame constructions including, but not limited to, those having individually formed right and left eye rims which are interconnected by a separate bridge element, and those having a single brow bar to which a lens or lenses are attached.

The eyewear front frame 12 and temples 14,16 each may be described as having an outside surface 12a, 13a, 14a and 16a, and an inside surface 12b, 13b, 14b, 16b, respectively, with the insides surface facing the users head and the outside surfaces facing away from the wearer's head when the eyewear 10 is worn. As described more fully below, the present invention provides an eyewear frame formed by injection molding two mold materials of differing hardness for forming the inside and outside surfaces of the frame, respectively. In the preferred embodiment shown and described herein, substantially all of the inside surfaces 12b, 13b, 14b, 16b of the frame are formed of a first mold material which is softer (i.e., less rigid) than the second mold material used for forming the outside surfaces 12a, 13a, 14a, 16a thereof. It is intended, however, that other embodiments are within the scope of the present invention, e.g., those having more than two mold materials, each of differing hardness values which may be formed in a continuous, layered manner. In addition, selected target areas of the frame (e.g., the nose pad area) may be formed of a mold material having yet another different hardness value than the remainder of the frame.

The benefits of an eyewear frame having an outside surface formed of a material which is more rigid than the material from which the inside surface is formed is discussed in the Summary of the Invention.

An eyewear frame made in accordance with the present invention involves providing first and second molds having first and second mold cavities, respectively (not shown). This method will first be described with regard to forming a unitary front frame such as 12. A first mold material is provided and introduced into the first mold cavity and allowed to harden. The first mold cavity is configured to form a base frame component 15 (see also Figs. 4-6) which includes outside surfaces 12a and 13a. Once cured, the base

frame component 15 is removed from the first mold cavity and placed in the second mold cavity. A second mold material is provided and introduced into the second mold cavity and allowed to cure. The second mold material bonds to the first mold material of base frame component 15 at the molecular level to provide a virtually inseparable, unitary front frame 12 which is released from the second mold cavity upon completion of the molding operation. The second mold material forms the inside surfaces 12b and 13b of front frame 12, and is selected to be less rigid than the first mold material comprising the outside surfaces 12a and 13a. Also, as seen best in Figs. 1 and 8, integral nose pads 12c may be formed with the second mold material in the nasal area adjacent bridge 13. Alternatively, separate nose pad component (not shown) may be subsequently attached thereto.

The first mold material (rigid) may be a nylon such as GRILAMID TR55LX, and have a hardness rating of about 50 Shore D. The second mold material (softer) may be a thermoplastic polyester elastomer or urethane (TPE or TPU) such as PEBAX 2533 or SANTOPRENE, etc., and have a preferred hardness rating in the range of about 55 to 73 Shore A, and a more preferred range of about 70 to 73 Shore A. The differing hardness between the co-molded first and second mold materials which make up the inside and outside surfaces of the front frame, respectively, provide a front frame which is rigid enough to maintain the eyewear in proper portioning on the face, yet soft on the inside surfaces to provide more comfort as well as a cushioning component between the rigid outer surfaces of the frame and the user's face.

Referring again to the molding operation, a pair of right and left eye plates (not shown) are inserted into the first mold cavity to form the right and left eye openings 26,28 of the front frame. These right and left eye plates also form the eye grooves 26',28' into which the peripheral edges of lenses 30,32 are inserted and secured, respectively (Figs. 1, 4-8). Upon removing the base frame component 15 from the first mold cavity, the right and left eye plates are transferred therewith into the second mold cavity. Upon completion of the second molding operation, the right and left eye plates are removed from the front frame 12, revealing the right and left eye openings 26,28 and the lens-receiving grooves 26',28' formed therein, respectively. In the preferred embodiment of the invention, the

grooves 26',28' are formed in the base frame component 15 which will retain the lens securely owing to the rigidity of the first mold material.

It will be noticed that second mold material extends slightly beyond the first mold material of base frame component 15 to form a ledge L (Figs. 1,8) along the meeting line of the two materials. This ledge L substantially eliminates the flash which would otherwise occur during the molding operations. There is no other finishing operations necessary with the present invention other than to remove the mold gate line (not shown).

Discussion is now turned to the temples 14,16 of eyewear 10. As stated previously, the present invention may be carried out on any component part of the eyewear 10 or on the entire eyewear 10. Thus, front frame 12 may be formed according to the invention and then have conventional temples attached thereto. Conversely, temples 14,16 may be formed in accordance with the present invention and then have a conventional front frame attached thereto. In the preferred embodiment shown and described herein, both the front frame 12 and temples 14,16 are formed in accordance with the present invention.

As seen best in Figs. 1,3 and 9, temples 14,16 each include an outside and inside surface 14a,16a and 14b,16b, respectively. As seen in the cross-sectional view of Fig. 9, each temple also includes a metal core 19 which enables the temples to be bent slightly to conform to the head of the wearer. Thus, to form the temples in accordance with the present invention, metal core 19 is first placed into the first temple mold cavity (not shown) and a first mold material is introduced therein, completely enveloping the metal core 19, and forming the outside surfaces 14a,16a of the temples 14,16, respectively. Once hardened, the first mold material 14a,16a and core 19 are removed from the first temple mold and transferred to a second temple mold cavity (not shown) wherein a second mold material is introduced to form the inside surfaces 14b,16b of temples 14,16, respectively. As with the front frame 12, the first mold material forming the outside surfaces 14a,16a is more rigid than the second mold material forming the inside surfaces 14b,16b. It will be noticed in Figs. 1 and 9 that the first mold material extends onto the inside surface at the temple tip to form a smooth, rigid surface 17 at the tip which facilitates gliding the temples against the sides of the wearer's head.

The present invention thus provides a novel eyewear frame manufacture and method which is rigid yet soft and cushioned where needed. The eyewear frame of the invention is extremely durable and aesthetically superior to molded frames having subsequently applied, foam cushioning material. As discussed, various modifications may be made to the invention as would be obvious to one skilled in the art. For example, the inventive method may be used to form individual eye rims which are secured together with a separate bridge component, or to form a single brow bar to which single or paired lenses are mounted.

What Is Claimed Is:

1. A method for manufacturing a front frame of an eyewear, said eyewear front frame having front and rear surfaces, said method comprising the steps of:
 - a) providing first and second molds adapted to form first and second mold cavities;
 - b) introducing a first liquid mold material into said first mold cavity and allowing said first mold material to cure and harden to form a base frame component;
 - c) removing and transferring said base frame component from said first mold cavity to said second mold cavity;
 - d) introducing a second liquid mold material into said second mold cavity in contact with said base frame component and allowing said second mold material to cure and harden, thereby bonding to said base frame component, said first and second mold materials together forming said eyewear front frame;
 - e) opening said second mold to release said eyewear front frame from said second mold cavity,
wherein said first mold material forms said front surface of said eyewear front frame, and said second mold material forms said rear surface of said eyewear frame, and wherein the cured-state of said first mold material is more rigid than the cured-state of said second mold material.
2. The method of claim 1, and further comprising the step of inserting a pair of right and left eye plates into said first mold cavity prior to introducing said first mold material therein.
3. The method of claim 2, and further comprising the step of transferring said pair of right and left eye plates together with said base frame component, from said first mold cavity to said second mold cavity.
4. The method of claim 1, wherein said first mold material is nylon.
5. The method of claim 1 wherein said second mold material is TPE.

6. The method of claim 5 wherein said second mold material has a hardness value in the range of about 55 Shore A to about 73 Shore A.
7. The method of claim 6 wherein said first mold material has a hardness value of about 50 Shore A.
8. The method of claim 7 wherein said first mold material is Nylon 12.
9. The method of claim 2, wherein said eyewear front frame includes right and left eye openings each having an inside perimeter, and wherein first and second eye plates are adapted to form a lens-receiving groove along the inside perimeters of each of said right and left eye openings.
10. The method of claim 9 wherein said lens-receiving groove of each of said right and left eye openings is disposed in said base frame component of said eyewear front frame.
11. The method of claim 1, wherein said eyewear further comprises a pair of temples each having an inside and outside surface, said temples pivotally secured to said eyewear front frame, and wherein said method further comprises the steps of:
 - a) providing first and second temple molds having first and second temple mold cavities, respectively;
 - b) placing a metal core into said first temple mold cavity;
 - c) introducing said first mold material into said first temple mold cavity and allowing said first mold material to harden;
 - d) removing and transferring said hardened first mold material from said first temple mold cavity to said second temple mold cavity;
 - e) introducing said second mold material into said second temple mold cavity and allowing said second mold material to harden; and

- f) removing said hardened second mold material together with said core and first mold material from said second temple mold cavity;
wherein said first hardened mold material removed from said first temple mold cavity forms said outside surface of said temples, and wherein said second mold material removed from said second temple mold cavity forms said inside surface of said temples.
12. The method of claim 11, wherein said temples each include a temple tip, and wherein said first mold material extends to said temple inside surfaces at said tips thereof, respectively.

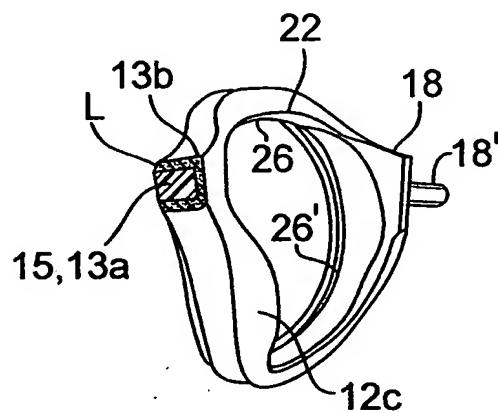
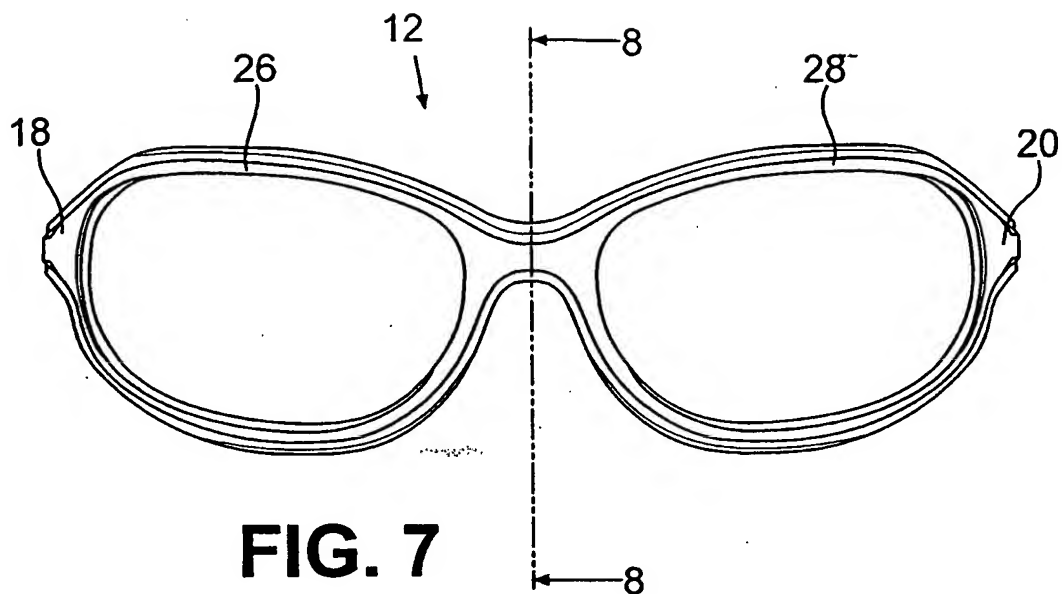


FIG. 8

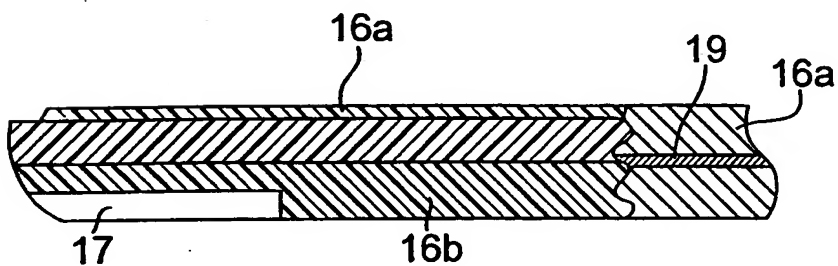


FIG. 9

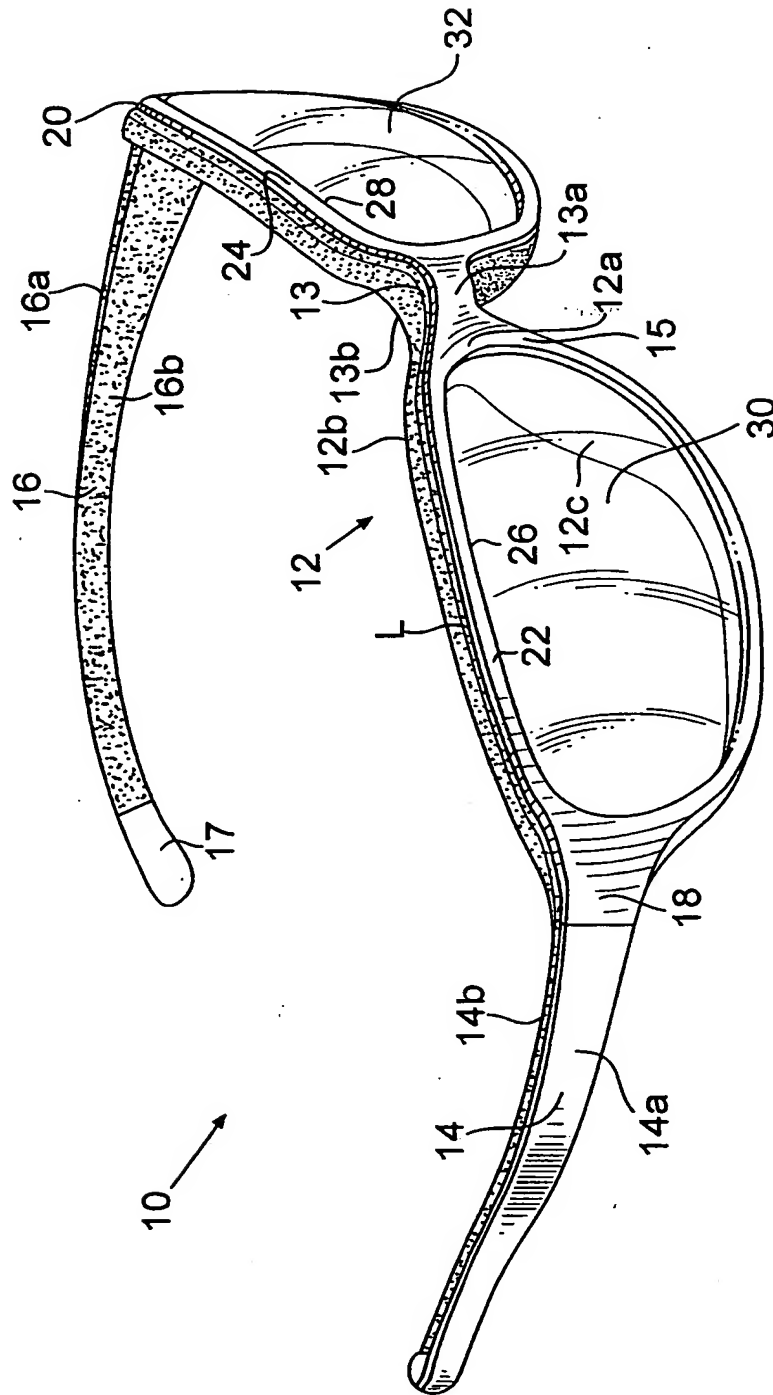


FIG. 1

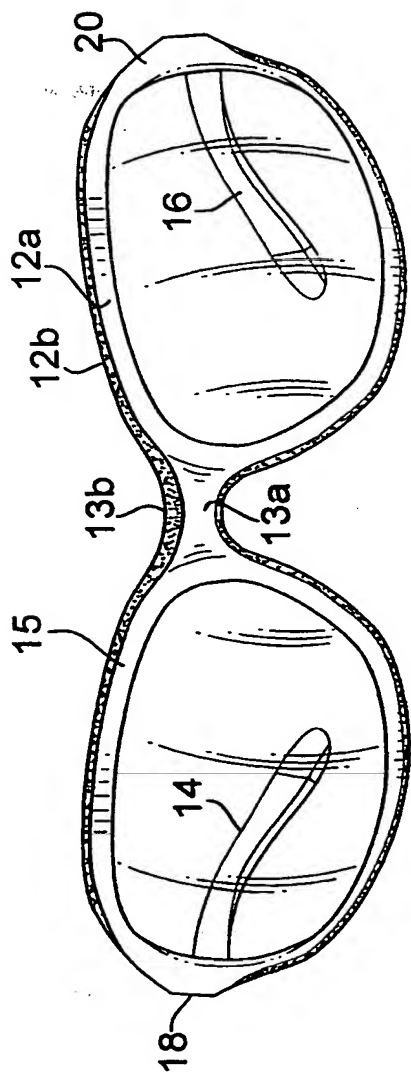


FIG. 2

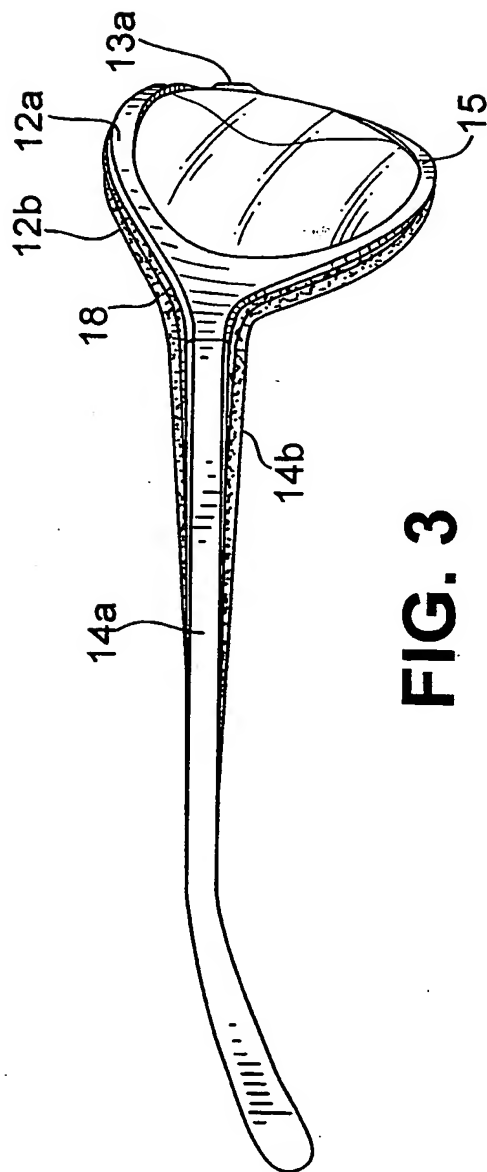
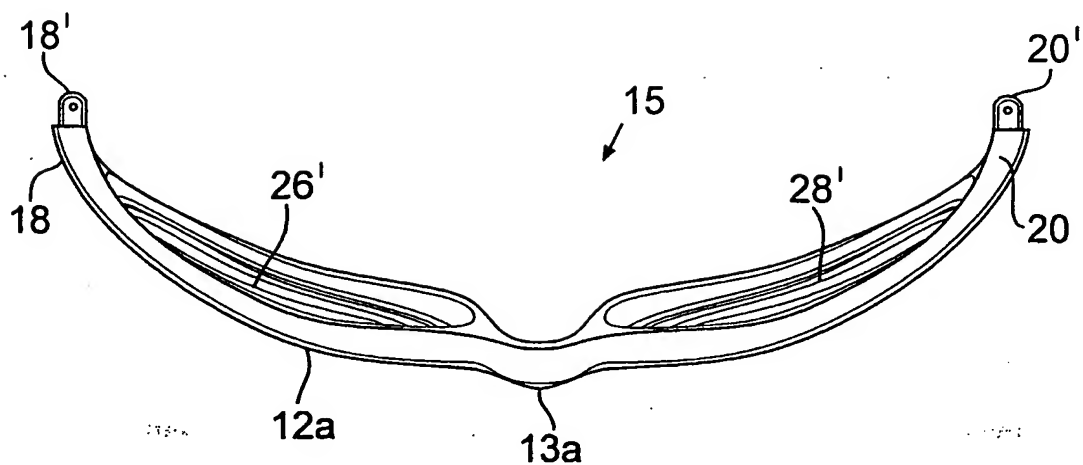
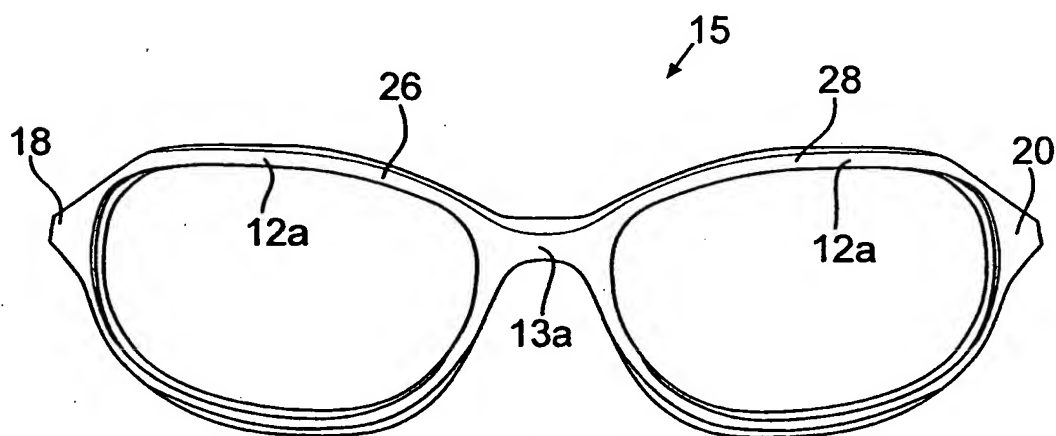
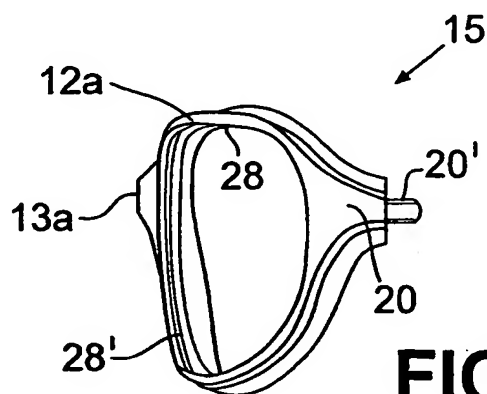


FIG. 3

**FIG. 4****FIG. 5****FIG. 6**

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/10090

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B29D12/02 G02C5/00 B29C45/16

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IPC 6 B29D G02C B29C

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 195 47 799 A (ANGER WILHELM) 7 August 1997 (1997-08-07) column 4, line 30 - line 39 column 5, line 22 - line 41	1-10
X	US 5 617 588 A (CANAVAN RICHARD W ET AL) 8 April 1997 (1997-04-08) column 2, line 63 - column 3, line 7	1-10
A	US 5 416 536 A (TEE JR RONALD S) 16 May 1995 (1995-05-16) cited in the application	1
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Date of the actual completion of the international search

4 August 1999

Date of mailing of the international search report

12/08/1999

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